Space Weather Forecast

Issued on Friday, 28 July 2023 at 13:14 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Ongoing daily Chance of Minor/Moderate R1/R2 radio blackouts from X-ray flares. Revised geomagnetic forecast now mainly quiet.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with X-ray flares showing frequent small Common-class activity, but peaking with a long duration Moderate-class around 27/2235UTC from a sunspot on the northeastern solar horizon.

There are currently up to ten sunspot regions on the facing side of the Sun, with the largest and most active of recent times now having departed over the western solar horizon. A new unnumbered region hoved into view in the southeast, manifesting as a magnetically unipolar group, but perhaps hiding detail. The main changes observed in the period have been strong proliferation of intermediate spots in a large sunspot in the northwest; and also development of numerous small spots around the main penumbral group in one in the south-centre.

A large 'filament' (arc of plasma - a potential Coronal Mass Ejection (CME) should it lift off with sufficient impetus) currently occupies the northeast of the Sun. While there are no current signs that any lift-off is imminent, it remains something to monitor given its narrowing angle with the Sun-Earth line in the period. Also of note is the fact that the oncoming eastern solar horizon appears to harbour CME-generating areas (with CMEs seen heading northeast and southeast in recent hours' satellite imagery) that may well correspond to large active regions here. Other CME activity was mainly observed from the southwest solar horizon to no effect at Earth.

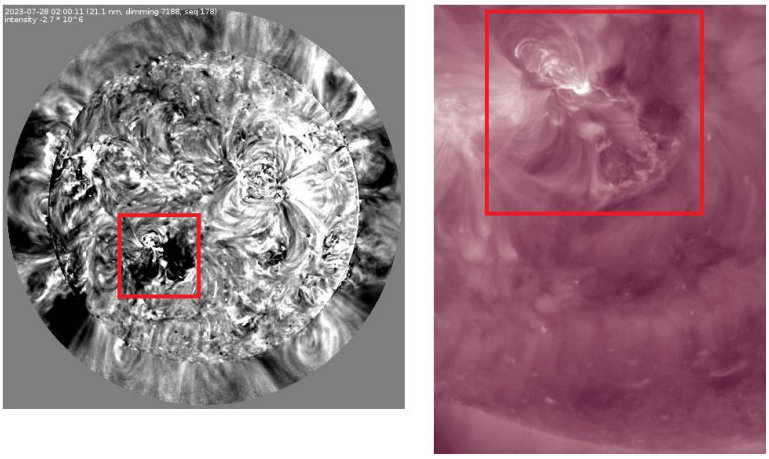

Figure 1: Lower left: time-integrated coronal dimming (processing courtesy SIDC ROB), showing boxed red an event of potential note from activity surrounding a sunspot region here. Also shown in a single false-colour extreme UV image of the same event. Satellite imagery is being monitored for any arising CME from this event.

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Perhaps the most noteworthy event of the period was a Common-class flare from the vicinity of the south-central sunspot group around 28/0200UTC. There are some indications that a CME could have been generated, although as yet the evidence is not clear from satellite imagery.

The previously advertised small filament around 27/1330UTC was further investigated and no CME was found, with no effect therefore anticipated.

At present then, there are no confirmed new Earth-directed CMEs, although imagery for the possibly generative event from the south-central sunspot group at 28/0200UTC is awaited.

Solar Wind / Geomagnetic Activity: The solar wind was reflective of a weak connection to a coronal hole high speed stream, likely that originating from a faint feature in the Sun's southwest. As a result the solar wind speed fell from slightly elevated to background levels, with the number of particles in the wind falling similarly. The associated magnetic field was smooth in character and also at background levels, with a north-south component not showing any prolonged anti-alignment with Earth's field (which would be to greater geomagnetic effect)

The net effect of the above solar wind measures was for provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of Moderate X-ray activity, as although the recent most active sunspot group has now departed, there are signs of a busy eastern solar horizon from recent CME evidence.

Solar Wind / Geomagnetic Activity: Contrary to earlier guidance, no CMEs are now thought to be en route. The sole fast wind in the period is the one manifesting at Earth at present, and a continued gradual exit is expected into the coming UTC weekend to leave predominantly quiet conditions throughout.

Energetic Particles / Solar Radiation: There remains a slight chance of solar radiation storms from any further significant X-ray flares that occur. This risk reduces a little through the period as the recent most active sunspot rotates further from the northwest around the far side.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	50	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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